



Silica Precipitation Activity of Si4-1 Peptide



WO 03/078451

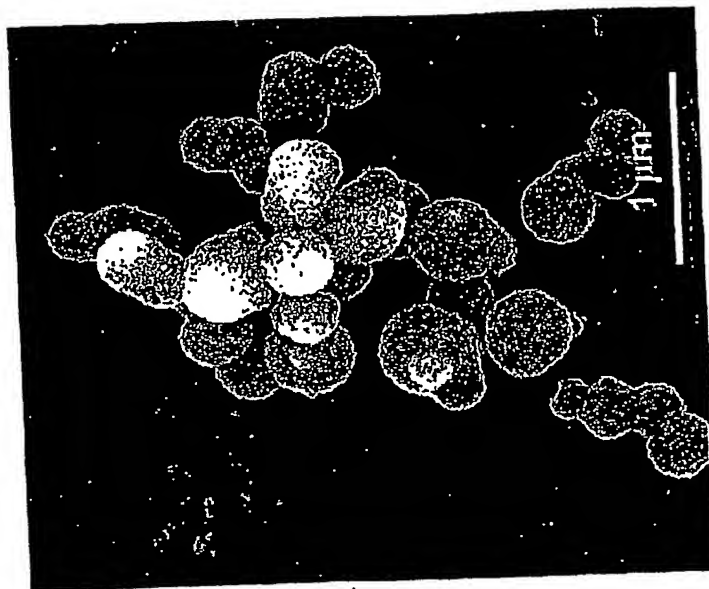
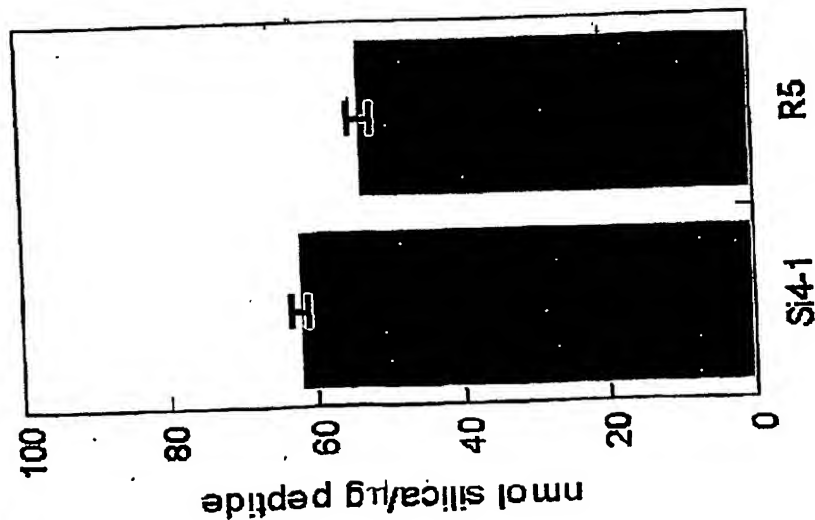
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FIG. 1A



SEM Micrograph

A 12 amino acid synthesized peptide based on the sequence displayed by phage clone 4-1 is also able to precipitate silica similar to the original phage clone.



Amino Acid Sequence of Silica Binding Peptides

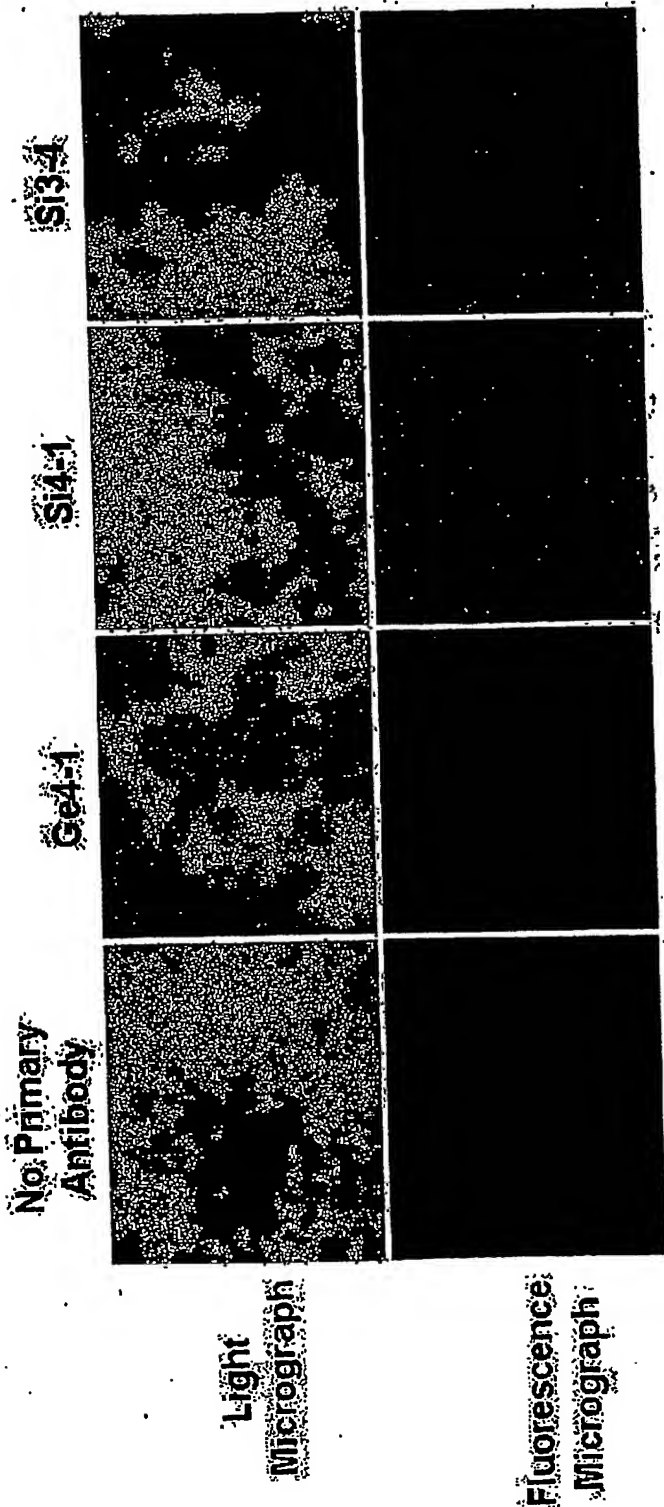
Number of clones
Isolated

S13-3	A	P	P	G	H	H	H	W	H	I	H	H	2
S13-4	M	S	A	S	S	Y	A	S	F	S	W	S	3
S13-8	K	P	S	S	H	H	H	H	T	G	A	N	6
S14-1	M	S	P	H	P	H	P	R	H	H	T		2
S14-3	M	S	P	H	H	M	H	H	S	H	G	H	2
S14-7	L	P	H	H	H	H	L	H	T	K	L	P	
S14-8	A	P	H	H	H	H	P	H	H	L	S	R	
S14-10	R	G	R	R	R	R	L	S	C	R	L	L	2
Ge4-1	T	V	A	S	N	S	G	L	R	P	A	S	
R5	S	S	K	K	S	G	S	Y	S	G	S	K	G
													S
													R
													R
													I
													L

FIG. 1B



Recognition of Silica by Phage Clones



Phage clones selected against silica exhibit binding to the surface of the silica particles, while a germanium selected clone Ge4-1 shows little or no binding to the silica surface.

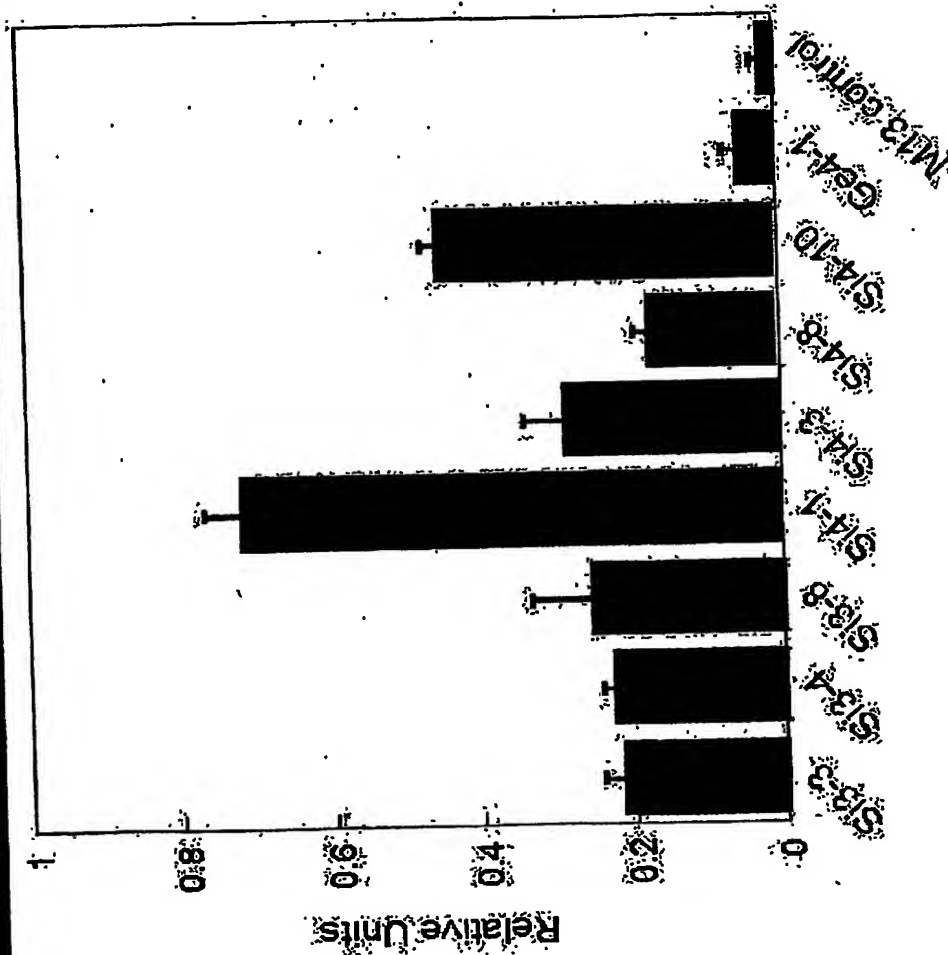
FIG. 2A



Binding of Phage Clones to Silica



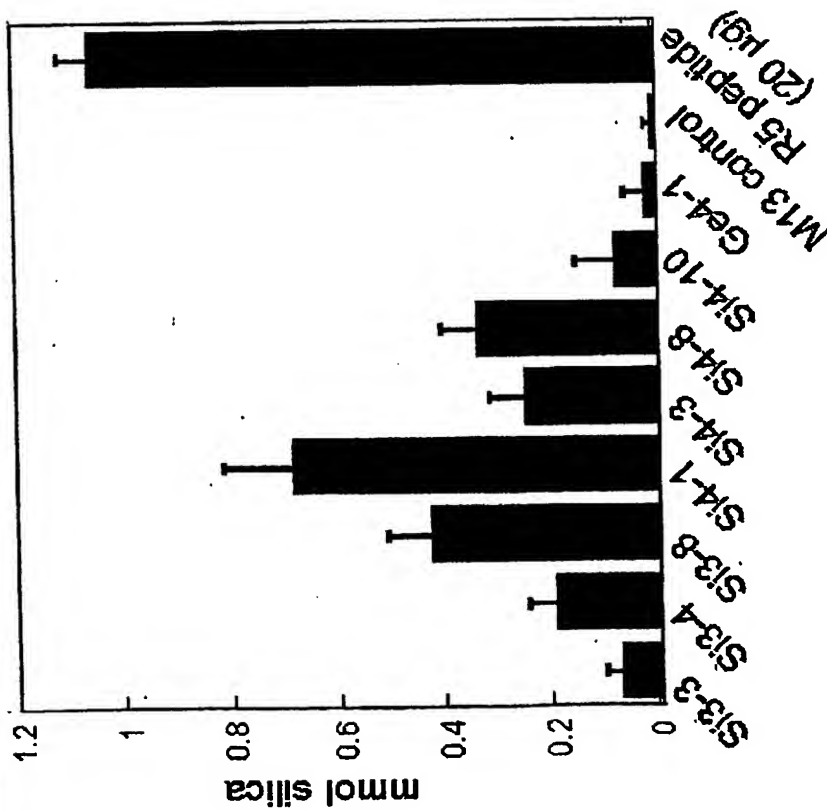
FIG.
2B



Phage Si4-1 and Si4-10 exhibit strong binding to the silica surface.



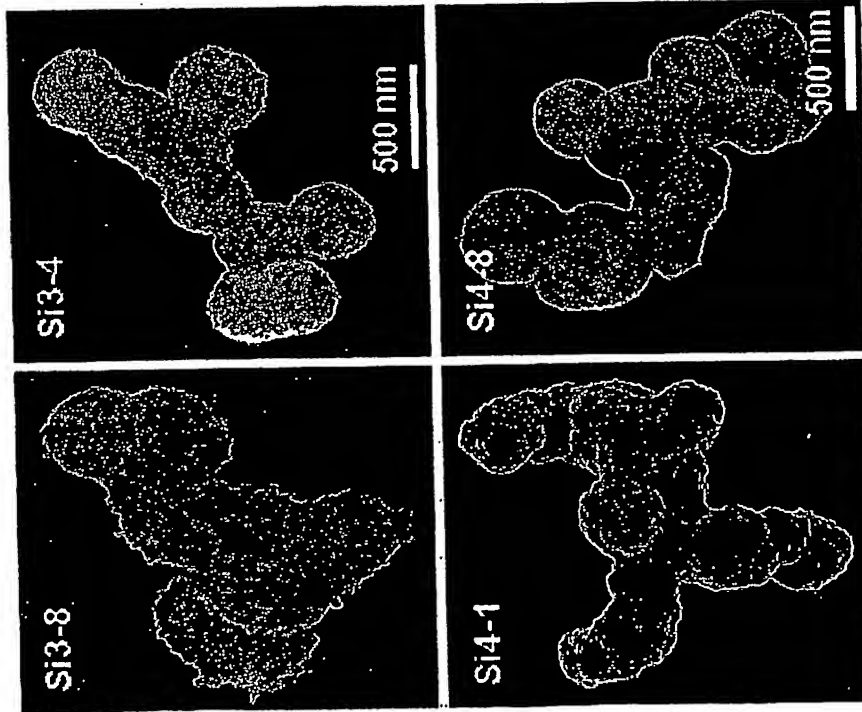
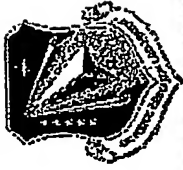
Silica Precipitation Activity of Phage Clones



Silica selected phage clones exhibit silica precipitation activity but to varying levels. Clones Si3-3, Si4-10 or germanium selected clone Ge4-1 exhibit little or no silica precipitation activity.



SEM Micrographs of Silica Precipitated by Phage Clones



Silica particles fuse to form a network. The diameter of single particles ranges between 200-400 nm

FIG. 4 A



Structural Analysis of Phage Precipitated Silica

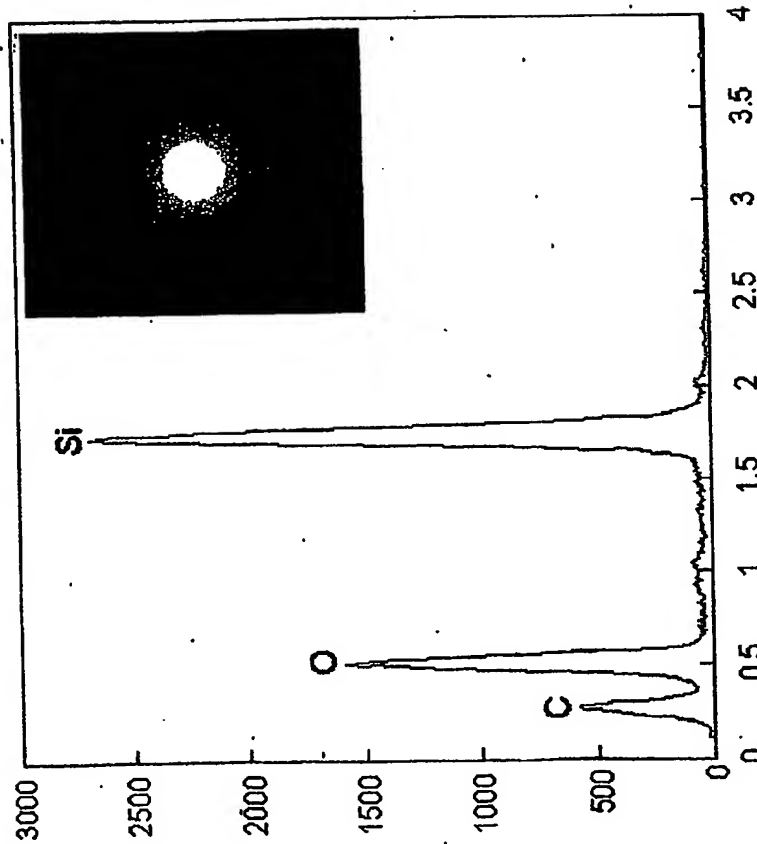
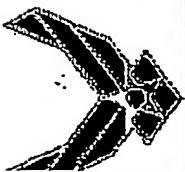


FIG. 4B

The EDX spectrum indicates high silica and oxygen content, the carbon signal is caused either by the peptide or the carbon coated grids used for TEM analysis. The electron diffraction pattern indicates the amorphous nature of the silica precipitate.

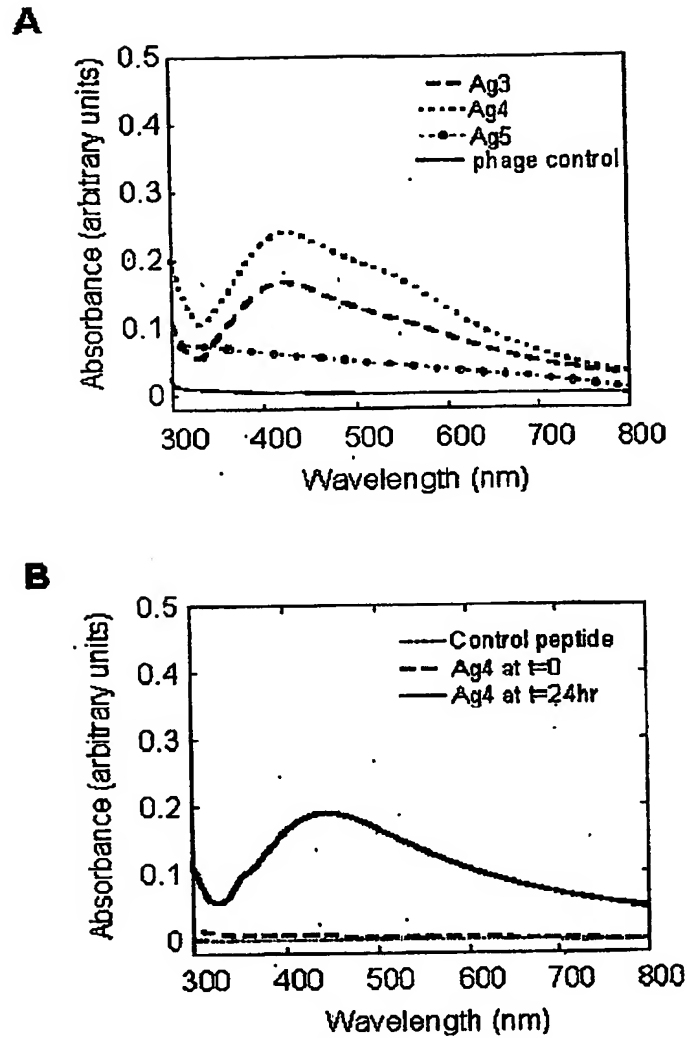


Figure 5

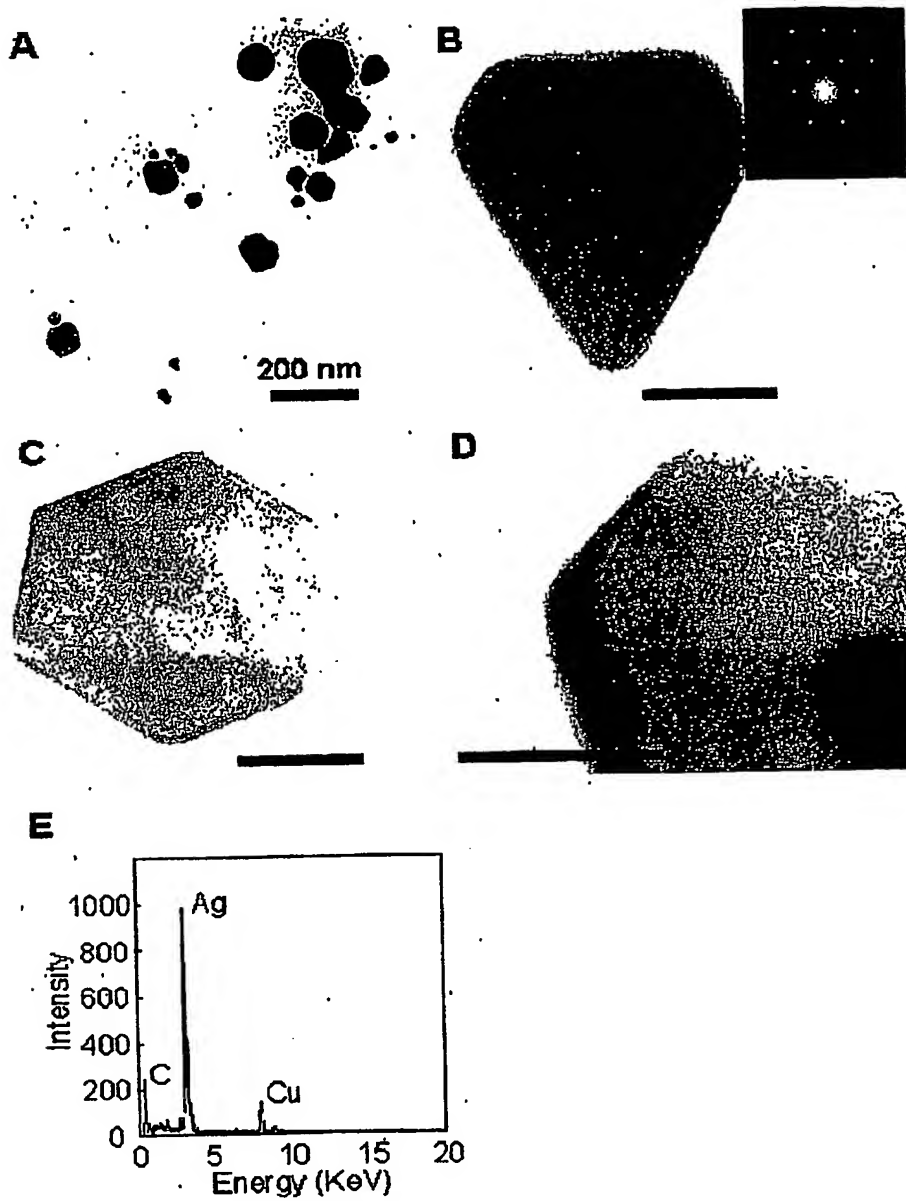


Figure 6

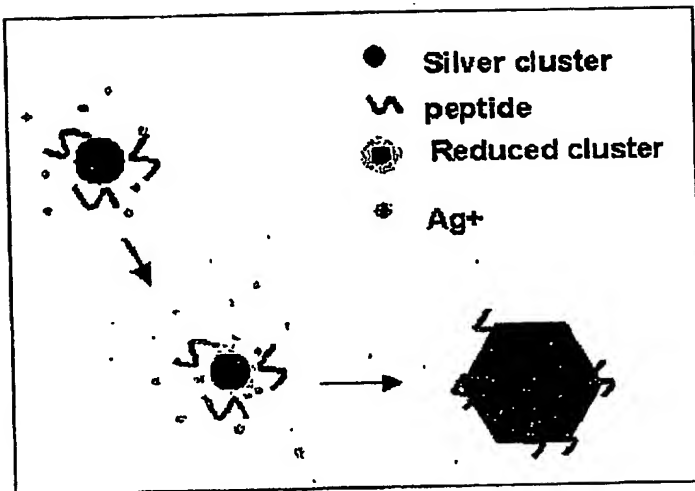


Figure 7

A

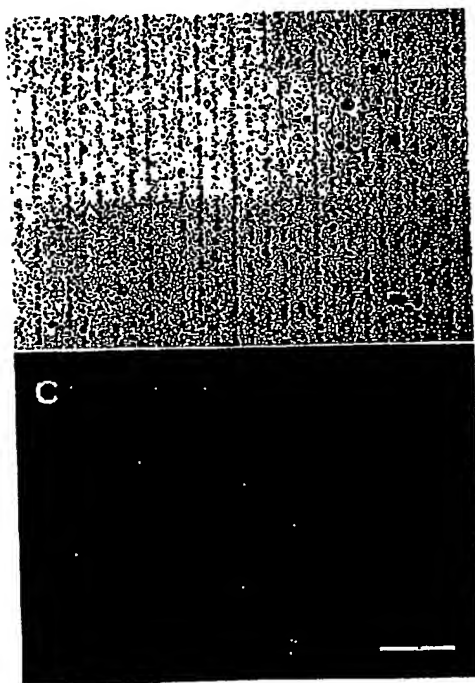
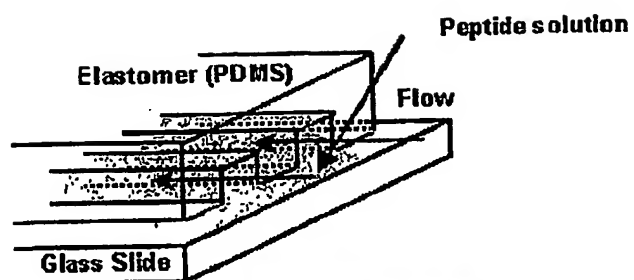


Figure 8

Selection of Silver Binding Peptides Using Phage Display Peptide Library

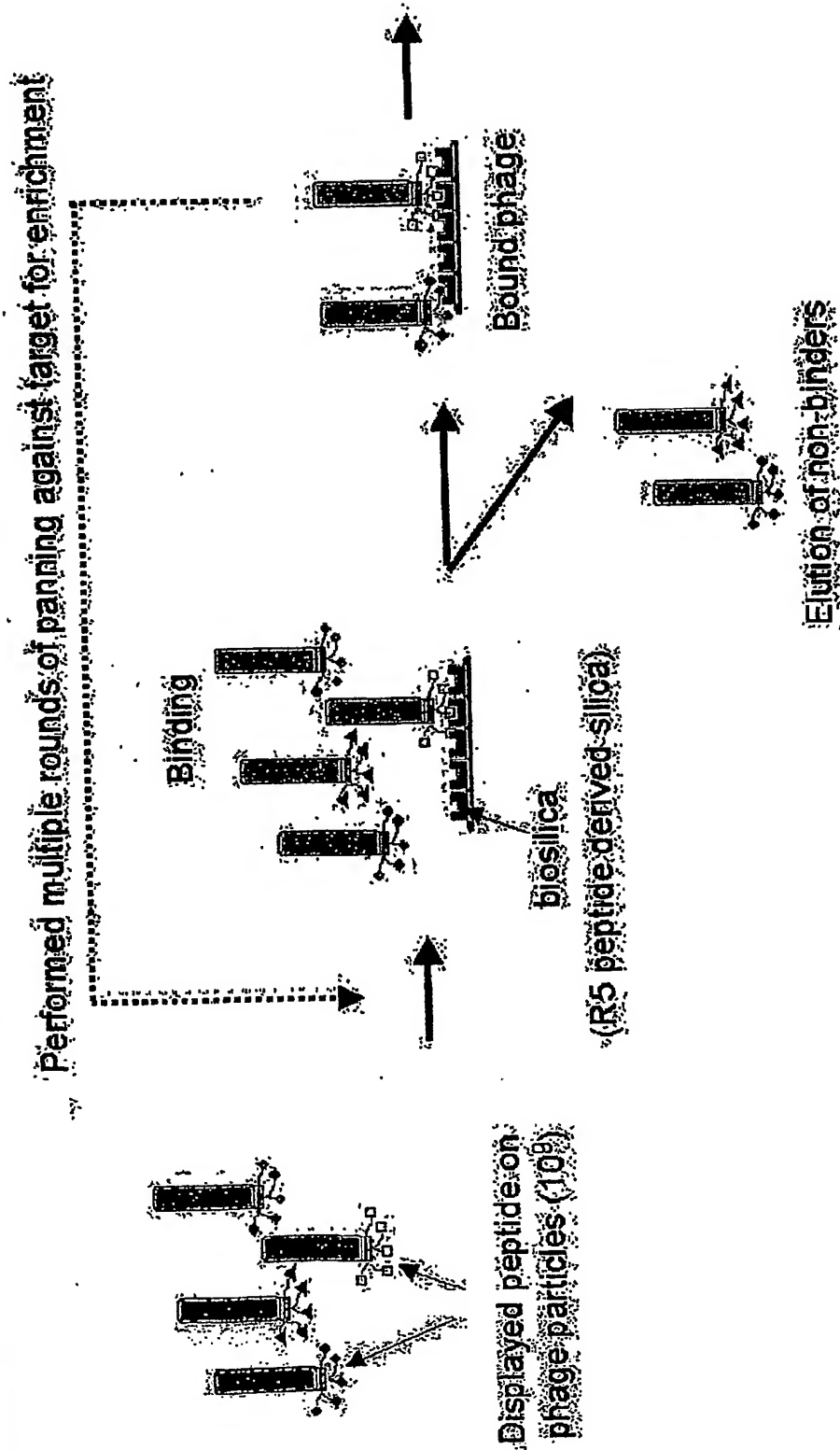


Fig. 9

Selection of Silver Binding Peptides Using Phage Display Peptide Library

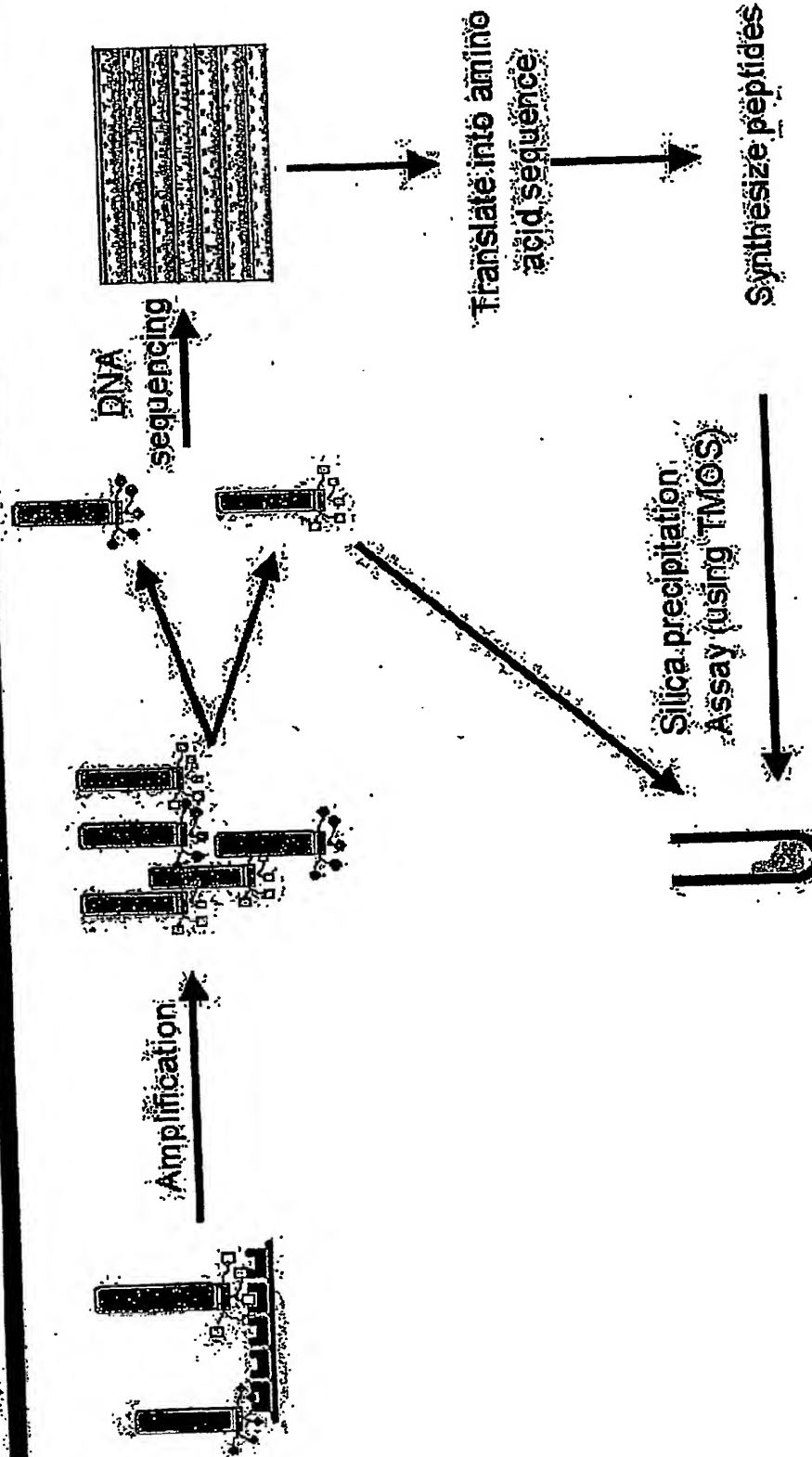


Fig. 10



Characteristics of the Selected Phage Clones



Phage Clone	Histidine Residues	Hydroxyl-containing Residues	pI	Silica Precipitating Activity (nmoles) [rank]
Si3-3	6	0	7.24	60 [8]
Si3-4	0	6	5.27	187 [6]
Si3-8	5	2	8.78	420 [3]
Si4-1	5	2	9.57	680 [1]
Si4-3	6	2	7.01	240 [5]
Si4-7	5	1	8.78	500 [2]
Si4-8	6	1	9.83	334 [4]
Si4-10	0	1	12.3	73 [7]

Based on the amino acid sequence information, peptides that have hydroxyl-containing amino acids and a high pI are essential for silica precipitating activity.

Fig. 11